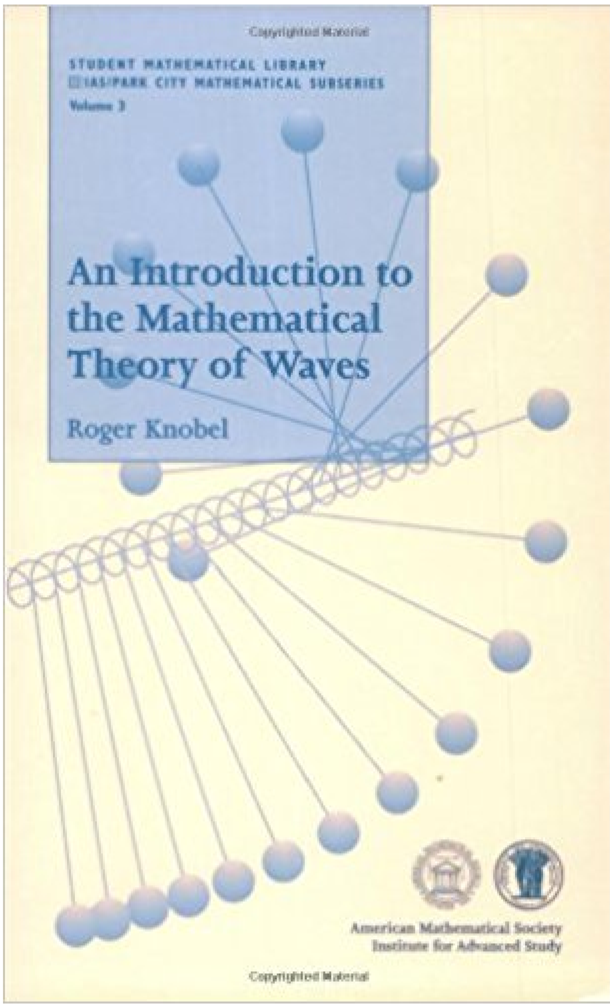
An Introduction To The Mathematical Theory Of Waves (Student Mathematical Library, V. 3)



Synopsis

This book is based on an undergraduate course taught at the IAS/Park City Mathematics Institute (Utah) on linear and nonlinear waves. The first part of the text overviews the concept of a wave, describes one-dimensional waves using functions of two variables, provides an introduction to partial differential equations, and discusses computer-aided visualization techniques. The second part of the book discusses traveling waves, leading to a description of solitary waves and soliton solutions of the Klein-Gordon and Korteweg-deVries equations. The wave equation is derived to model the small vibrations of a taut string, and solutions are constructed via d'Alembert's formula and Fourier series. The last part of the book discusses waves arising from conservation laws. After deriving and discussing the scalar conservation law, its solution is described using the method of characteristics, leading to the formation of shock and rarefaction waves. Applications of these concepts are then given for models of traffic flow.

Book Information

Series: Student Mathematical Library, V. 3 (Book 3)

Paperback: 196 pages

Publisher: American Mathematical Society; UK ed. edition (September 9, 1999)

Language: English

ISBN-10: 0821820397

ISBN-13: 978-0821820391

Product Dimensions: 0.5 x 5.5 x 8.5 inches

Shipping Weight: 9.6 ounces (View shipping rates and policies)

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Customer Reviews

"An interesting first reading on high analysis at an elementary level." ---- European Mathematical Society Newsletter"The book offers a student an excellent introduction to some of the most interesting wave phenomena that have physical significance, and at the same time it also serves to explain some of the deeper mathematical issues that are involved. It can be recommended to all undergraduates who wish to learn something about physics wave phenomena of various types." ---- Mathematical Reviews"The style of this book is not that of a typical textbook. For one, the very short sections (few exceed five pages in length) have a more interactive, conversational flavor rather than the usual "theorem-proof" style of most texts. This is not to say that it lacks in precision; far from it, in fact. Very carefully constructed short exercise lists occur frequently throughout the book and often times, immediately following a discussion of a difficult topic: they are not all collected and placed, out of context, at the end of the chapter. It is the intention that every exercise be completed as part of the journey through the material, and not simply to practice a technique. The problems are all very relevant to the material presented and many challenge the student to extend the theory he or she just learned in a slightly tangential direction. Also, a common theme in the text is to revisit the same problem at several different points in the book and each time investigate it more carefully using the theory just developed. This spiraling approach is very clever, and it instills in the reader a sense of what is going on. "The exposition of the material is very clear. All in all, this book provides a sturdy bridge from a course on ordinary differential equations, and so I would recommend it, without batting an eyelash, to any of my differential equations students who wish to continue their study independently. Further, I feel that it could be very useable as a text for a first course in partial differential equations. Kudos to Roger Knobel on having produced such a well-written and much-needed book!" -- ---- MAA Online

Best math textbook I've yet studied.

Excellent book covering wave mechanics

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